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①⑨ ①A

# CANADIAN PATENT

⑤④

METHOD OF MANUFACTURING PILE FABRIC

⑦⑩

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②①

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②②

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PRIORITY DATE

No. OF CLAIMS

10

**SUBSTITUTE**

***REMPLACEMENT***

**SECTION is not Present**

***Cette Section est Absente***

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#### FIELD OF INVENTION

This invention relates to a method of manufacturing pile fabric, such as velvet. In particular, this invention relates to the method of manufacturing pile fabric wherein the fabric may be woven on a flat bed loom.

#### PRIOR ART

10 The most common method of manufacturing pile fabric such as velvet calls for the use of a special loom which is specifically designed for use in the manufacture of velvet and is commonly referred to as a "velvet loom". This type of loom is expensive to manufacture and maintain. Furthermore, the "velvet loom" can only be used for the manufacture of a pile fabric, and consequently a weaver must have a sufficient work load to maintain the "velvet loom" in continuous use in order to justify the cost of the equipment and the space which it occupies. Furthermore, specialized personnel are required in order to operate and maintain "velvet looms". As a result of the above difficulties encountered in the use of "velvet looms", there is little or no velvet production in Canada.

20 While velvet material is particularly attractive because of its appearance and feel, it is usually possible to remove individual pile threads by pulling them out of their base material.

#### SUMMARY OF INVENTION

The present invention overcomes the difficulties of the prior art described above by providing a method of making a pile fabric which includes the step of weaving the fabric on a conventional flat bed loom. Furthermore, the method of the present invention provides a pile which is napped as opposed to being cut so that it is not readily removable.

According to an embodiment of the present invention a method of manufacturing a pile fabric comprises the steps of weaving



on a flat bed loom, an interlocking base fabric and laying-in at least one additional weft of a loosely spun yarn or roving between each set of base forming wefts. The additional weft is brought to the face of the fabric in the area of the fabric which is to have a pile surface and the additional weft is napped to form a pile without any significant napping of the base fabric. According to a further embodiment of the present invention, a method of manufacturing a fabric having a pile on at least one face comprises the steps of weaving, on a flat bed loom, an interlocking base fabric and laying-in at least one additional weft of a loosely spun yarn or roving between each set of adjacent base forming wefts, the additional weft being brought to the face of the fabric in the area in which it is to have a pile surface, padding the woven material in a chemical solution, napping the face of the fabric so as to nap the additional weft to form a pile without any significant napping of the base fabric, polishing the napped fibres to remove their crimp, electrostatically charging the napped fibres to an aligned configuration and shearing the pile surface to the required height.

#### PREFERRED EMBODIMENT

The invention will be more clearly understood after reference to the following detailed specification read in conjunction with the drawings, wherein

Figure 1 is a diagrammatic illustration of a horizontal cross-section taken through the warp ends of the fabric according to an embodiment of the present invention;

Figure 2 is a diagrammatic illustration of a longitudinal cross-section taken through the weft of the fabric of the type illustrated in Figure 1;

Figures 3a, 3b and 3c are weave diagrams which illustrates various fabrics which may be used in the present invention;

Figure 4 is a back weave view of the weave of Figure 3;

Figure 5 is a cross-sectional view similar to Figure 1 showing an alternative manner of laying-in the additional weft;

Figure 6 is a weave diagram of the weave illustrated in Figure 5;

Figure 6a is a weave diagram illustrating a further form of weave; and

Figure 7 is a cross-sectional view similar to Figure 5 showing an alternative manner of laying-in the weft.

With reference to Figures 1 and 2 of the drawings, the warp ends are identified by references W1, W2, W3, W4, W5, W6, W7 and W8, and the weft or picks are identified by references P1, P2, P3, P4, P5 and P6.

The warp ends W1 to W8 are made from a tightly twisted yarn and may be of a material such as cotton, rayon, or continuous filament warps of any of the well known synthetic fibres. Tightly twisted yarns are generally used as warp ends in weaving and are of particular advantage in the present process in that they resist napping. An interlocking base fabric is formed by weaving wefts P1 and P2 about each of the warp ends W1 to W8. It will be understood while a 1 and 1 plain weave is illustrated in Figure 1, an interlocking base fabric can be achieved by an alternative weave.

In the embodiment illustrated in Figure 1, two additional wefts of a loosely spun yarn or roving P3 and P4 are laid-in and the weft P3 is brought to the face of the fabric on which the pile is to be provided after warp end W1, while weft P4 is brought to the pile face of the fabric after warp end W2. As previously indicated, the wefts P3 and P4 are preferably made from a loosely spun yarn or roving so as to be readily napped. The wefts P3 and P4 are preferably brought to the surface after different warpings so that each adjacent set of base forming wefts may be located in close proximity to one another underlying the wefts which are brought to the face, as is diagrammatically illustrated in the back weave view in Figure 4, as will be described hereinafter.

Wefts P1, P2, P3 and P4 are the only wefts shown in Figure

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1 of the drawings in view of the fact that the weave is repeated so that, as shown in Figure 2 of the drawings, P5 and P6 are located relative to the warp ends in the same manner as P1 and P2, that is to say, they form the next set of interlocking base wefts. The weft P5 is free to move towards the weft P2 due to the fact that the wefts P4 and P3 are held in place with one of the warp ends W1 and W2 that are raised over P2 and P5. The bringing of the wefts P1 and P2 to close proximity to the wefts P5 and P6 serves to form a self-supporting interlocking base material so that even if the wefts P3 and P4 are substantially weakened by napping, the strength of the base material is not reduced to any significant extent.

While it is common practice to bring alternately the weft or the warp yarn to a face of a material in order to produce a surface pattern, investigations of the known weaving techniques have shown that if the known materials are napped in the areas where the weft or the warp is alternately brought to the surface to form a pattern, the effect of napping is to substantially weaken or destroy the cloth. For example, if a conventional pocket double cloth having two warp arrangements and two fillings woven two and two were to be napped, the resultant weakening of the napped face would be such that the material would fall apart in use. Similarly, if a material such as a double pocket fabric with stitcherpick and stuffer on the back or inside the pocket only having one warp and two fillings was napped, the face would be so weakened that again the material would fall apart. A material such as damask which consists of one warp and one filling could not be successfully napped because of the fact that napping of the filling would result in complete degradation of the fabric.

Figures 3a<sup>3b</sup> and 3c of the drawings serve to illustrate the manner in which the various weaves are set out and repeated. In Figure 3a of the drawings the area 1A is the areas at which wefts P1 to P4 are woven about warp ends W1 to W8 in a weave which cor-

responds to the weave illustrated in Figure 1. The lateral shifting of the weave of the weft is also illustrated in Figure 3a. It will be noted that the weave of wefts P1 and P2 is a one and one weave, whereas the weave of wefts P3 and P4 is a one and seven weave. The weaves illustrated in the areas 2A and 3A of Figures 3b and 3c respectively serve to illustrate alternative weave patterns which are repeated.

As previously indicated, Figure 4 of the drawings is a diagrammatic view of the back weave of the fabric illustrated in Figures 1, 3a, 3b, and 3c from which it will be seen that wefts P1, P2, P5, P6, P9 and P10 are visible, while wefts P3, P4 P7 and P8 do not appear at the back of the fabric. When viewed from the back face, the wefts P3, P4, P7 and P8 are in fact buried.

Figure 5 of the drawings illustrates a weave wherein the base is again formed by interlocking one and one wefts P1 and P2. The weft P3 is laid-in in a one and two weave. Figure 6 diagrammatically illustrates the arrangement of the various warps and wefts in a manner similar to Figure 3. Again it will be noted that an interlocking base is formed by wefts P1 and P2, while weft P3 is exposed to napping. Again if weft P3 is napped, the reduction in strength of the weft will not reduce the strength of the base so that the material will be held together.

From the foregoing it will be apparent that this alternative weave may be used to form the interlocking base and the laying-in of the weft may also employ a variety of different weaving configurations. It is important to note, however, that in each of the weaves described above the base is woven so as to be interlocking and the filler weft is laid-in in such a manner that it may be napped without effecting any significant reduction in the strength of the woven material as a whole. Even if the laid-in weft was accidentally napped to the point where it became completely severed, the material would have a sufficient strength derived from the interlocking base to hold together.



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A further alternative weave is illustrated in Figure 7 wherein the base material is the one and two weave. As is well known, this weave is capable of providing a strong interlocking base. Wefts P3 and P4 are introduced in a manner similar to the wefts P3 and P4 of Figure 1.

10 In the manufacture of velvet material according to the present invention, the material is first woven as described above so that the weft is brought to the face on which the velvet may be carried out so as to provide a continuous pile surface over the total area of the fabric or a localized pile surface in any required pattern. The present invention is particularly suitable for use in the manufacture of Jacquard or Dobbie design multi-colour pile fabrics. The weaving may be carried out on a simple flat bed loom, such as W3 flat bed loom or a C4 flat bed loom manufactured by Crompon & Knowles Corporation, Worcester, Massachusetts, U.S.A.

20 After the fabric has been woven it is then subjected to a padding operation in which the fabric is treated with a chemical solution, such as a softener, in a well known manner. The padding serves to soften before napping the fabric.

30 After padding the material is in a condition suitable for napping. Because of the fact that the wefts which form the base material are formed from a tightly twisted yarn, whereas the wefts which are laid in are of a loosely spun yarn or roving, it is possible to nap the loosely spun yarn or roving without napping the base material so that the base material is not weakened. After napping the fibres are polished in a conventional polishing device to remove the crimp. The fabric is then subjected to an electrostatic charge so that the napped and polished fibres are axially aligned. The pile surface is then sheared to obtain a uniform length of pile fibre.

As previously indicated, the end product may have a Jacquard

or Dobbie design and may be a multi-colour pile fabric.

10      The production of a velvet pile fabric material by the method of the present invention enables conventional flat bed looms to be used in the weaving of the product without requiring any special adapters or modifications to the loom. As a result it is possible to use the same flat bed loom in the production of the velvet-like material as is used in the production of any other material which is woven on a flat bed loom. In view of the fact that almost all weavers have a number of flat bed looms of one type or other, it is possible for these companies to become active in the production of velvet-like material without the necessity of acquiring a "velvet loom". Furthermore the product of the present invention is not one in which it is necessary to completely sever the wefts which are used to provide the pile surface.

Other advantages of the method of the present invention will be apparent to those skilled in the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of manufacturing a fabric having a pile on at least one face, comprising the steps of

(a) weaving, on a flat bed loom, an interlocking base fabric and laying-in at least one additional weft of a loosely spun yarn or roving between each set of adjacent base forming wefts, said additional weft being brought to said one face in the area of the fabric which is to have a pile surface, and

(b) napping said one face of said fabric to nap said additional weft to form a pile without any significant napping of the base fabric.

2. A method as claimed in Claim 1 wherein at least two additional wefts are laid-in between each set of adjacent base forming wefts.

3. A method as claimed in Claim 2 wherein the additional wefts which are laid-in are brought to the face of the fabric at different warp ends.

4. A method as claimed in Claim 1 wherein said additional weft extends over at least two warp ends in the area at which it is brought to the pile face.

5. A method as claimed in Claim 2 or 3 wherein said additional wefts extend over at least two warp ends in the area at which they are brought to the pile face.

6. The method as claimed in Claim 1, 2 or 3 wherein said woven material is padded prior to napping.

7. A method as claimed in Claim 1, 2 or 3 wherein the napped fibres are polished to remove crimp, electrostatically charged to an erect position and sheared to the required lengths.

8. A method of manufacturing a fabric having a pile on at least one face, comprising the steps of

(a) weaving, on a flat bed loom, an interlocking base fabric and laying-in at least one additional weft of a loosely spun yarn or roving between each set of adjacent base forming wefts, said additional weft being brought to said one face in the area of the fabric which is to have a pile surface,

(b) padding said woven material,

(c) napping said one face of said fabric to nap said additional weft to form a pile without any significant napping of the base fabric,

(d) polishing the napped fibres,

(e) electrostatically charging the napped fibres to assume an erect position, and

(f) shearing the napped fibres to the required length.

9. A method of manufacturing a fabric as claimed in Claim 8 wherein at least two additional wefts are laid-in between each set of adjacent base forming wefts.

10. Method of manufacturing a velvet fabric including the steps of weaving a base fabric having at least one set of warp threads of tightly twisted yarn and at least one kind of weft on a flat bed loom and laying-in at least one additional kind of weft of a loosely spun yarn which is brought to the face of the material as required to provide any desired pattern, padding the woven material to prepare the laying-in yarn for napping, napping the face of the material to nap the laying-in yarn, polishing the fibres to remove the crimp, electrostatically charging the material to vertically align the napped fibres, and shearing the vertically aligned napped fibres to provide the required depth of velvet pile.



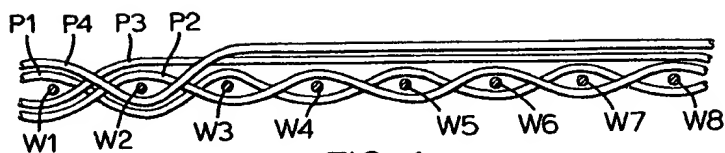


FIG. 1

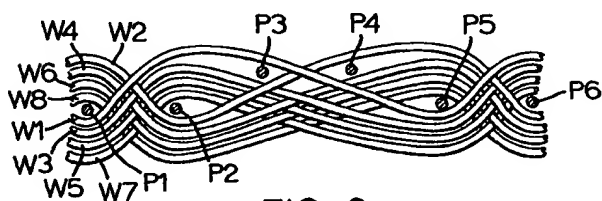


FIG. 2

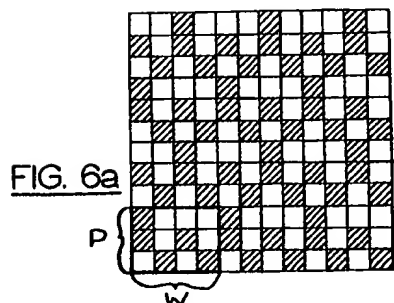


FIG. 6a

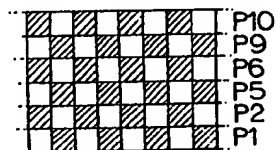


FIG. 4

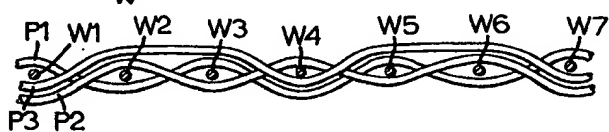


FIG. 5

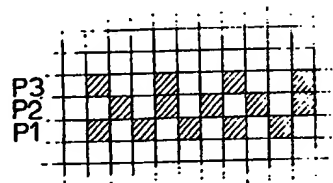


FIG. 6

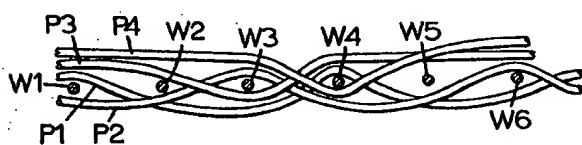


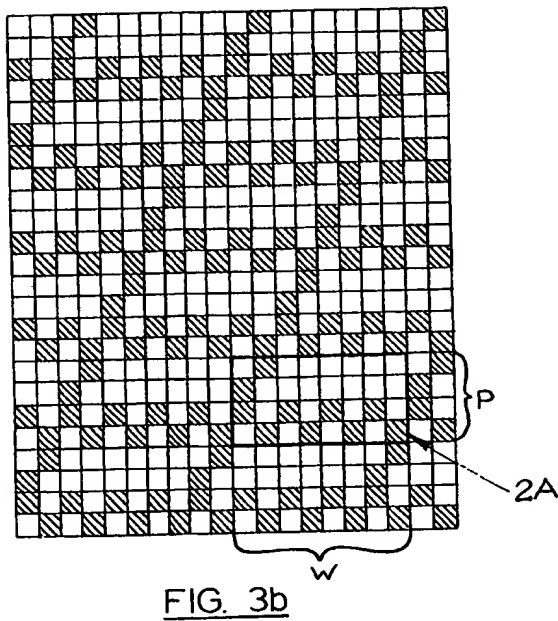
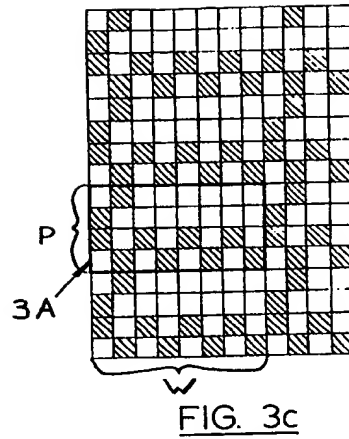
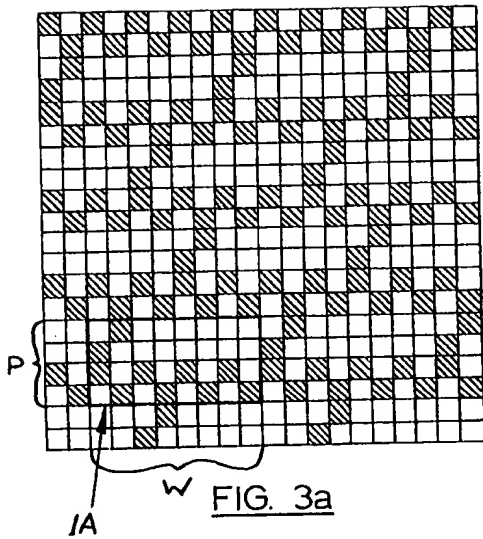
FIG. 7

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